

x86-64™ Technology Specification Overview

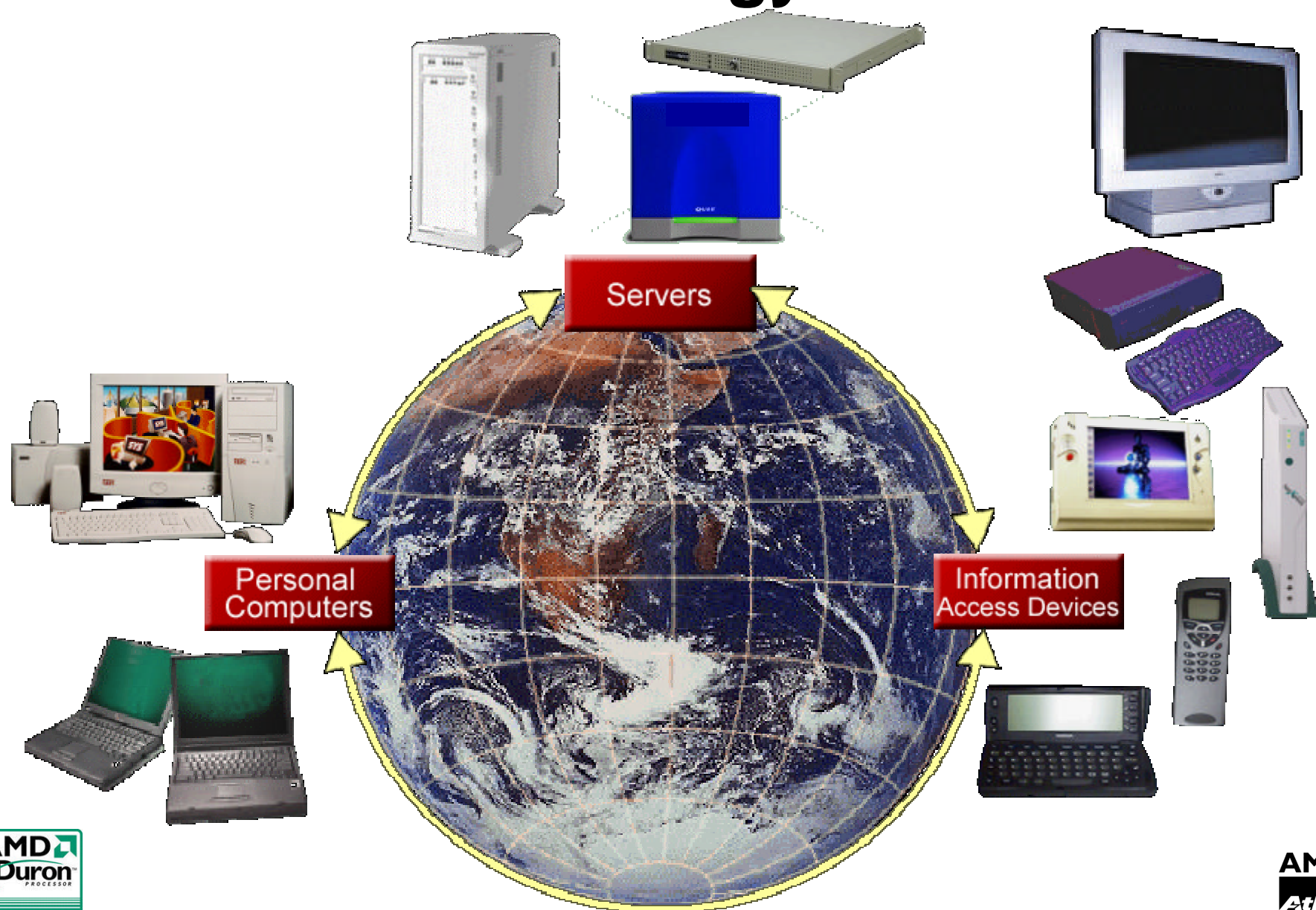


Agenda

- **AMD Corporate Strategy**
- **AMD x86-64™ Technology Strategy**
- **Industry Implications**
- **Specification Technical Overview**
- **Market Messages**



AMD's 3 Track Strategy



Today's Announcement

- **What is being announced**
 - Public distribution of “AMD x86-64™ Architecture Programmers Overview”
- **What this achieves**
 - Formally begins application ports and engagement with broad development community



Why 64-bit Computing?

- **Large memory applications**
 - Database
 - Digital Content Creation
 - Mechanical CAD
 - Electronic Design Automation
- **Security and Encryption**
- **Internet Content Delivery**
- **Simulations**
 - Weather prediction
 - Oil Exploration



AMD's 64-bit Computing Strategy

- **Implement a straightforward approach to 64-bit computing by building on the x86 architecture**
- **Deliver 64-bit advantages while providing full x86 compatibility**
- **Deliver technology that seamlessly integrates into existing computing and support environment**



Industry Implications

- | | |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor vendors | <ul style="list-style-type: none">• Deliver 64-bit functionality with x86 compatibility• Bonus: 64-bit performance and 32-bit installed base |
| Platform suppliers | <ul style="list-style-type: none">• Minimal impact on motherboard design, OS, and stability• Decrease cost of technical support for two (32-bit and 64-bit) systems |
| Software vendors | <ul style="list-style-type: none">• Enable development of 32-bit and 64-bit applications in parallel without doubling costs• Not forced to choose between support for 32- or 64-bit application development |
| MIS managers | <ul style="list-style-type: none">• No need to plan for major IT transition, replace 32-bit applications, or re-train in-house development and support staff• No risk of being "left behind" with incompatible 32-bit technologies |
| End users | <ul style="list-style-type: none">• Not "forced" to upgrade to 64-bit apps and new OS• Leverage performance enhancements to dual 32/64 chips |

Only AMD x86-64™ Technology Addresses All These Needs!



AMD x86-64™ Technology : A Better Idea

- **Designed with the following features:**
 - Backward compatible - Full 32-bit x86
 - Familiar instruction set extended for 64-bit
 - Enhanced memory model for 64-bit addressing
- **Enables more robust CPU designs:**
 - Single core for both 32- and 64-bit
 - Unified support for execution of 32- and 64-bit applications
 - Performance enhancements improve both modes at the same time



AMD x86-64™ Technology : Key Innovations

- New 64-bit processor mode (Long Mode)
- 64-bit flat virtual memory addressing
- Instruction set enhancements
- Doubled the number of registers (now 16)
- Fully featured compatibility mode



Long Mode Feature Overview

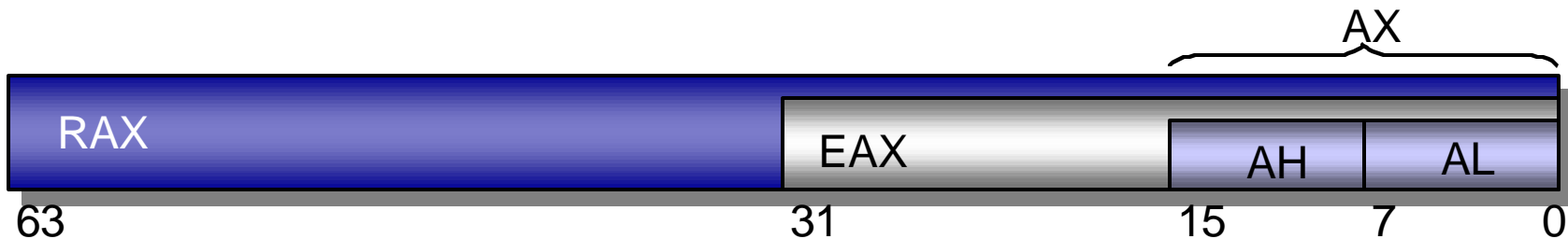
- Architectural support for 64 bits of virtual address (2,305,843,009,213,693,952 bytes)
- Double (16) the number of Integer/Address registers
- Added 64-bit integer operations
- Added 16 register IEEE standard floating point unit
- Innovative PC relative memory addressing
- Fully compatible with existing x86 modes

Flag	64-Bit OS	64-Bit Application	Data Size	CPU Mode
Flag Setting	Off	X	Small	Standard 16-bit
	Off	X	Large	Standard 32-bit
	On	Off	Small	Compatible 16-bit
	On	Off	Large	Compatible 32-bit
	On	On	Small	New 64-Bit
	On	On	Large	Reserved



General Purpose Registers

- **Registers are extended to 64-bits**
(analogous to extensions from 8 to 16 and 16 to 32)
- **Added 8 new registers (R8 - R15)**
- **Long Mode register names (RAX, RBX ... R14, R15)**
- **Control and debug registers extended to 64-bits**



Advancing the Potential of x86

- **New operand / address sizes rather than new instructions**
- **Extends existing mechanisms rather than creating new ones**
 - New operand and address sizes built on current code segment and prefixes
 - New paging extensions built on current PAE mode
- **Future CPU improvements accelerate both 32-bit and 64-bit performance at the same time**



The Better Choice for Enterprise Computing

- **The most straightforward approach to 64-bit computing**
 - Not a major disruption, preserves existing instruction set
 - Proven, familiar methodology for extending architecture
- **Seamless integration with existing environments**
 - Introduces advantages of 64-bit while retaining existing software, tools, drivers, etc.
 - Leverages the billions of dollars invested in existing software
 - Maintains existing support and maintenance procedures
- **AMD continues to deliver the ultimate computing experience**
 - Performance for both 32 and 64-bit applications at same time
 - Brings architectural superiority of AMD Athlon™ processors to high-end x86 markets



Summary

- **The “x86-64™ Architecture Programmers Overview” available today**
- **x86-64 architecture fulfills AMD strategy of offering superior 64-bit alternative**
- **Advances potential of x86**
- **Technology is proven, stable, compatible, and better approach**
- **AMD is well positioned to emerge as an enterprise leader**



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